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Validation of landslides caused by Typhoon No. 12, 2011 using Normalized Soil Water Index in the Kii Peninsula, Japan

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In September 2011, catastrophic landslide disasters triggered by record-breaking rainfall due to Typhoon No. 12 (Talas) caused numerous casualties and property damage in the Kii Peninsula, Japan. This study analyzed the relation among the cumulative event rainfall, the maximum hourly rainfall intensity, and the maximum Normalized Soil Water Index (NSWI) for 30 large landslide occurrences. Cumulative event rainfall and maximum hourly rainfall intensity are basic rainfall variables for landslide hazard assessment, and NSWI represents the conceptual soil water content calculated by a hydrological model normalized by the past ten years' largest value. The results show that the distribution of cumulative event rainfall and maximum hourly rainfall intensity do not correspond to landslide locations. However, the maximum NSWI well explains the landslides' locations; landslides occurred in the area where the NSWI was extremely higher than that in the past decade. Heavy rainfalls frequently occur in the Kii Peninsula where mean annual precipitation is higher than in other regions in Japan. Our results indicate that the relative value of NSWI (compared with historical records) is more effective for landslide hazard assessment than the absolute rainfall variables in regions with frequent rainfall. Additionally, NSWI can be validated in other regions where heavy rainfall frequently occurs, and can be used, along with the results of other studies, to assess regional landslide hazards.

Keywords: Landslide, Typhoon No. 12, 2011, Kii Peninsula, NSWI, Cumulative event rainfall, Maximum hourly rainfall intensity